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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/994,038	12/18/1997	SHUNPEI YAMAZAKI	07977/208001	6059

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FISH & RICHARDSON, PC
4350 LA JOLLA VILLAGE DRIVE
SUITE 500
SAN DIEGO, CA 92122

EXAMINER	
COLEMAN, WILLIAM D	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 05/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	08/994,038	YAMAZAKI ET AL.	
	Examiner	Art Unit	
	W. David Coleman	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Peri d f r Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,5-12 and 14-26* is/are pending in the application.

4a) Of the above claim(s) *7-10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,5-9 and 14-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 29, 2003 has been entered.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 16, 17, 19, 20, 21, 22 and 25 is rejected under 35 U.S.C. 102(b) as being anticipated by Mizutani et al., U.S. Patent 5,043,785.

Pertaining to claim 1, Mizutani discloses a semiconductor device as claimed. See **FIG. 1**, where Mizutani teaches a charge transfer semiconductor device including a CCD, said CCD comprising:

a crystalline semiconductor film **2** having a plurality of crystals extending in a crystal growth direction;

a charge storing means including a plurality of photodetecting elements (**3,4**) being for storing a charge in accordance with an incident light; and

a charge transfer means for transferring the charge stored in the charge storing means,

Mizutani also discloses wherein a crystal structure of the crystalline semiconductor film **2** is continuous in the crystal growth direction so that the crystal structure is regarded as sing crystal for the charge (column 3, lines 13-20),

Wherein a charge transfer direction (horizontal) of the charge transfer means is coincident with the crystal growth direction.

3. Pertaining to claims 17 and 20, Mizutani discloses wherein the crystalline semiconductor film **2** is formed over a quartz substrate **1**.

4. Pertaining to claims 16 and 19, Mizutani discloses a semiconductor device comprising:

a crystalline semiconductor film **2** being formed on an insulating surface **1**,

said crystalline semiconductor film having a plurality of crystals extending in a crystal growth direction (polycrystalline) which is parallel to the insulating surface;

an insulating film **6** on the crystalline semiconductor film **2**;

a plurality of electrodes being formed on the insulating film, each of said plurality of electrodes being located within a predetermined distance so that a plurality of MOS capacitors **7** are formed between the plurality of electrodes and the crystalline semiconductor film 2 with the insulating film **6** therebetween,

wherein a charge transferred from one of the MOS capacitors to another of the MOS capacitors in a charge transfer direction,

wherein a crystal structure of the crystalline semiconductor film is continuous so that the crystal structure is regarded as single crystal for the charge,

wherein the charge transfer direction is coincident with said crystal growth direction.

5. Pertaining to claim 18, Mizutani discloses wherein the semiconductor device consist of an image sensor.

6. Pertaining to claims 21 and 22, Mizutani discloses an image sensor (CCD), which consist of a photodiode.

7. Pertaining to claims 25 and 26, Mizutani discloses a semiconductor device comprising:

a photoelectric conversion (silicon interacting with light) formed over an insulating surface;

a charge coupled device electrically connected to the photoelectric conversion device and formed over the insulating surface;

said charge coupled device including:

a crystalline semiconductor film formed on the insulating surface, said crystalline semiconductor film having a plurality of crystals (polycrystalline silicon as taught by Mizutani) extending in a crystal growth direction which is parallel to the insulating surface;

an insulating film on the crystalline semiconductor film (MOSFET section);

a plurality of electrodes (having a predetermined distance, which becomes an active matrix display) formed on the insulating film (Mizutani teaches forming an array, column 6, lines 8-11) so that a plurality of MOS capacitors are formed between the plurality of electrodes and the crystalline semiconductor film with the insulating film therebetween,

wherein a charge is transferred from one of the MOS capacitors to another of the MOS capacitors in a charge transfer direction,

wherein the charge transfer direction is coincident with the crystal growth direction.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 2, 5, 6, 11, 12, 14 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizutani et al., U.S. Patent 5,043,785 in view of Funakoshi et al., U.S. Patent 5,650,644.

10. Pertaining to claims 2, 6 and 24, Mizutani discloses a semiconductor device substantially as claimed. See **FIG. 1**, where Mizutani teaches a semiconductor device comprising:

a photodiode being formed on an insulating surface **1**;

a charge coupled device on the insulating surface; at least a horizontal charge coupled device on the insulating surface, said horizontal charge coupled device,

wherein a crystal structure of the crystalline semiconductor film **2** in the crystal growth direction is continuous so that a charge moving is not restricted by a grain boundary (monocrystalline). However, Mizutani fails to teach a vertical charge coupled device being connected with a plurality of photodiodes, wherein at least one of the vertical and horizontal charge coupled devices comprises a crystalline semiconductor film having a plurality of crystals extending in a crystal growth direction.

Funakoshi teaches a semiconductor device having a plurality of vertical charge coupled devices and horizontal charge coupled devices connected with horizontal charge coupled devices. See **FIG. 1** of Funakoshi where both vertical charged coupled devices and horizontal

charged coupled devices are connected to form a image sensor. In view of Funakoshi, it would have been obvious to one of ordinary skill in the art to incorporate the vertical charged coupled device connected to the horizontal charge coupled device in the Mizutani semiconductor device because the charge transfer loss is minimized and the transfer efficiency is improved (Abstract, last sentence).

11. Pertaining to claim 23, Mizutani fails to disclose further an active matrix display device. Funakoshi teaches a semiconductor device to be an active matrix display device. In view of Funakoshi, it would have been obvious to one of ordinary skill in the art to incorporate the active matrix display device of Funakoshi into the Mizutani device because a high quality picture is reproduced (column 1, lines 25-27).

12. Pertaining to claim 11, Mizutani discloses wherein the crystalline semiconductor film 2 is formed over a quartz substrate, and wherein an incident light is made from a side of the quartz substrate.

13. Pertaining to claim 12, Mizutani discloses wherein the charge transfer direction includes a plurality of directions (polycrystalline film option).

14. Pertaining to claim 14, Mizutani discloses wherein the semiconductor film is a silicon film.

Objections

15. The disclosure is objected to because of the following informalities: claims 16 and 19 claim a plurality of crystals (i.e., polycrystalline) for the crystal growth direction and at the same time claims a single crystal for the structure having a plurality of crystals. The phrase "or" should be placed somewhere in the claims to separate "plurality of crystals" and "single crystal"

16. Claim 5 is objected to as being dependent on a previously cancelled claim. Appropriate correction is required.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

W. David Coleman
Primary Examiner
Art Unit 2823

WDC
May 9, 2003